

WHAT IS CLAIMED IS:

1           1.    A lithium secondary battery comprising a positive  
2    electrode which is capable of occluding and releasing lithium, a  
3    negative electrode which is capable of occluding and releasing  
4    lithium, a separator between the positive electrode and the  
5    negative electrode, and a nonaqueous electrolyte comprising a  
6    nonaqueous solvent and a wettability improving agent,

7           wherein the nonaqueous solvent does not have substantial  
8    wettability to the separator,

9           the wettability improving agent is dissolved in the nonaqueous  
10   solvent, improves wettability of the nonaqueous solvent to the  
11   separator, and has an oxidative decomposition potential in a range  
12   of 4.5 V to 6.2 V based on the potential of a lithium reference  
13   electrode.

1           2.    The lithium secondary battery according to claim 1,  
2    wherein the oxidative decomposition potential of the wettability  
3    improving agent is smaller than that of the nonaqueous solvent.

1           3.    The lithium secondary battery according to claim 1,  
2    wherein a reductive decomposition potential of the wettability

3     improving agent is not greater than 0.0 V.

1           4.     The lithium secondary battery according to claim 2,  
2     wherein a reductive decomposition potential of the wettability  
3     improving agent is not greater than 0.0 V.

1           5.     The lithium secondary battery according to claim 1,  
2     wherein a mass ratio of the wettability improving agent relative to  
3     the nonaqueous solvent is not greater than 3 mass %.

1           6.     The lithium secondary battery according to claim 2,  
2     wherein a mass ratio of the wettability improving agent relative to  
3     the nonaqueous solvent is not greater than 3 mass %.

1           7.     The lithium secondary battery according to claim 3,  
2     wherein a mass ratio of the wettability improving agent relative to  
3     the nonaqueous solvent is not greater than 3 mass %.

1           8.     The lithium secondary battery according to claim 4,  
2     wherein a mass ratio of the wettability improving agent relative to  
3     the nonaqueous solvent is not greater than 3 mass %.

1           9.    The lithium secondary battery according to claim 1,  
2    wherein the oxidative decomposition potential of the wettability  
3    improving agent is in a range of 4.8 V to 5.2 V.

1           10. The lithium secondary battery according to claim 2,  
2    wherein the oxidative decomposition potential of the wettability  
3    improving agent is in a range of 4.8 V to 5.2 V.

1           11. The lithium secondary battery according to claim 3,  
2    wherein the oxidative decomposition potential of the wettability  
3    improving agent is in a range of 4.8 V to 5.2 V.

1           12. The lithium secondary battery according to claim 4,  
2    wherein the oxidative decomposition potential of the wettability  
3    improving agent is in a range of 4.8 V to 5.2 V.

1           13. The lithium secondary battery according to claim 5,  
2    wherein the oxidative decomposition potential of the wettability  
3    improving agent is in a range of 4.8 V to 5.2 V.

1           14. The lithium secondary battery according to claim 6,  
2    wherein the oxidative decomposition potential of the wettability

3 improving agent is in a range of 4.8 V to 5.2 V.

1 15. The lithium secondary battery according to claim 7,  
2 wherein the oxidative decomposition potential of the wettability  
3 improving agent is in a range of 4.8 V to 5.2 V.

1 16. The lithium secondary battery according to claim 8,  
2 wherein the oxidative decomposition potential of the wettability  
3 improving agent is in a range of 4.8 V to 5.2 V.

1 17. The lithium secondary battery according to claim 1,  
2 wherein the separator comprises polyethylene, the electrolyte  
3 comprises a mixture of ethylene carbonate and  $\gamma$ -butyrolactone and  
4 the wettability improving agent is selected from the group  
5 consisting of 1,2-dimethoxyethane (DME), tetrahydrofuran (THF), 2-  
6 methyltetrahydrofuran (2-MeTHF), 1,3-dioxolane (DOL), 4-methyl-1,3-  
7 dioxolane (4-MeDOL), N,N-dimethylformamide (DMF), N-  
8 methylpyrrolidone (NMP), methyl formate (MF) and dimethyl sulfoxide  
9 (DMSO).